Syllabus for
EM 600A/ PME 600A
Engineering Economics and Cost Analysis

Text:
Park, Chan S., *Contemporary Engineering Economics,* Fourth Edition, Prentice-Hall,
ISBN 0-13-187268-7

Additional Material:
Ganguly, Anirban, *Using Excel for Engineering Economics,* First Edition, (Electronic Version to
be provided to the students for free)

Overview
This syllabus provides a course description, course objectives, the grading plan, homework
guidance, and other administrative details necessary for successful completion of EM 600. This
course is an integral part of the Engineering Management program because it is focused on
applications of economics and finance in making effective engineering decisions. Since many
aspects of engineering involve selection of an optimal alternative based on both technical as well
as economic criteria, a robust working knowledge of engineering economics is an important skill
to have for any Engineering Manager. The set of Engineering Economic tools and techniques that
students will take away from EM 600 will serve as powerful tools to aid in selecting, designing,
implementing and improving any engineering project. A major goal of the course is to develop
an ability to make sound decisions using various engineering economics techniques, thereby
facilitating the evaluation and selection of alternative solutions.

Course Objective
In this course the students will be exposed to the analysis of financial data the concept of interest
rates and time value of money. Students will be able to make choices between alternative
projects using a set of basic tools and techniques of engineering analysis, including the time
value of money, internal rate of return and benefit cost ratio. Furthermore, the student will be
able to gather a comprehensive knowledge about advanced engineering economics topics like
depreciation of assets, after tax cash flows and inflation. In addition, the student will gain
knowledge about important decision making tools like sensitivity analysis, risk analysis and
simulation.

Course and Text Material
The primary text for this course is *Contemporary Engineering Economics*, 4th Edition, by Chan S.
Park. Most reading assignments, homework, and class problems will be based on this text. The
students are highly recommended to purchase a copy of this text. Also, bring your calculator to
class every day as this course will involve a lot of mathematical calculations. All other material;

lecture notes, documents, homework, etc is located on Moodle. Students should access Moodle and download the material they need to complete the course.

*As a part of this course, you will be expected to use MS Excel® on a regular basis. The supplemental textbook titled **Using Excel in Engineering Economics** by Anirban Ganguly will serve as a valuable companion to solving engineering economics problems using Excel®. Please make sure you have an electronic copy of the book for your referral.*

The course schedule provides the lesson topics, the dates for the homework assignments, midterm, final and class discussions**. The due dates for the Homework Problems and the examinations are provided in the schedule.** All assigned problems are to be done individually. However, you may reference someone else on the assignment, if you went to him or her for assistance. Solutions will be gone over in class.

LATE ASSIGNMENTS WILL NOT BE ACCEPTED FOR CREDIT.

Details on Graded Assignments:

Unless otherwise stated, grades will be assigned as detailed below. An answer will be marked "correct" if it's 100% correct. If an answer has arithmetic errors, but is conceptually correct, a portion of the total points associated with that particular problem will be deducted. If an answer is conceptually and mathematically wrong it will be marked "wrong", and the student will not receive any credit**. If you do not show your work, but have a correct final answer, it will be marked "wrong" and only partial credit would be given.** Note also, partial credit would be provided if you have a wrong answer but have shown the correct steps of calculations.

Some assignments require the students to provide the instructor with an electronic spreadsheet with the solutions to certain problems. In that case, an answer will be marked 100% "correct" if both the numerical values and the Excel function used are correct. Points will be taken off for mathematical errors and NO CREDIT will be given if the financial function used is incorrect.

Homework (25%): Students should turn in their homework problems as designated in the schedule. As stated earlier, no credit will be assigned for late submission. The students are advised to get in touch with the instructor with any doubts / clarification regarding any assignment well before the submission deadline.

Midterm Exam (25%): The midterm examination will be held on week 8 and will comprise of Lectures 1 - 7. Details of the Midterm and its due date can be found out from the course schedule.

Final Exam (30%): The final examination will be held on week 14 and will comprise of lectures 8 - 14. It will be a take-home examination that is due on the following Saturday by Midnight. Details of the Final examination and its due date can be found out from the course schedule.

<u>Late Homework and Make-up Exams</u>: Late homework and make-up exams will be provided to the student only if there is a situation of unavoidable emergency (for

example, being hospitalized during the exam, serious illness during the exam or just before the exam, death in the family, etc.). This requires a written excuse and is solely based on the discretion of the instructor. If you do not submit homework or take an exam, you will receive a zero for the corresponding submittal.

Class Discussion (20%): The course will consist of ten *class discussions* that will comprise 20% of the total grade. The primary reason for including the class discussion is to facilitate the participation of the students in discussion various concepts and ideas about engineering economics. The class discussion will either be a short debate / Q & A session (on a specific engineering economics topic) at the end of the lecture and/or asking the students to provide a short write up on some current scenarios in engineering economics or specific areas of engineering economics, or a blend of both. The specific nature of the class discussions will be conveyed by your instructor.

Most notes used during class can be found on Stevens Canvas. E-mails will be sent if updates are available.   It is recommended that you print the notes prior to class, taking only additional notes and examples during class.

Ethical Conduct: The following statement is printed in the Stevens Graduate Catalog and applies to all students taking Stevens courses, on and off campus,

"Cheating during in-class tests or take-home examinations or homework is, of course, illegal and immoral. A Graduate Academic Evaluation Board exists to investigate academic improprieties, conduct hearings, and determine any necessary actions. The term 'academic impropriety' is meant to include, but is not limited to, cheating on homework, during in-class or take home examinations and plagiarism"

Therefore, serious action will be taken if a student (or a group of students) is found to have taken unfair means to successfully complete a given assignment. The punitive actions may result to a zero in the respective assignments to receiving an "F" for the course. Further consequences of academic impropriety might result in a warning from the Dean of the Graduate School, which becomes a part of the permanent student record, to expulsion from the school (*The Graduate Student Handbook, Academic Year 2003-2004 Stevens Institute of Technology, page 10).*

Consistent with the above statements, all homework exercises, tests and exams that are designated as individual assignments MUST contain the following signed statement before they can be accepted for grading.

I pledge on my honor that I have not given or received any unauthorized assistance on this assignment/examination. I further pledge that I have not copied any material from a book, article, the Internet or any other source except where I have expressly cited the source.

Signature _____   Date: _____

Cell Phones: Please turn cell phones to vibrate mode during class. Cell phones ringing during class are considered disruptive behavior and the students are therefore asked to comply with this request.

Course Syllabus (Modules 1 – 13)

Overview	#	Topics	Book Chapter(s)	Details
Basics of Engineering Economics	1	Introduction to Engineering Economics	***Park:*** 1 ***Ganguly:*** Excel for Engineering Economics	- The objectives / overview of this course. - What is engineering economics? - Why study engineering economics? - Types of decisions in engineering economics. - Limitations of engineering economics. - Fundamental principles of engineering economics. - Introduction: Excel in engineering economics.
	2	Understanding Cash Flow Diagrams, Interest Rates and Time Value of Money	***Park:*** 3, 4	- Time value of money - Cash flow diagram: basis, 'how to' and types (arithmetic, geometric gradient) - Overview of simple and compound interests – calculation methods including continuous compounding - Nominal, periodic and effective interest rates - Equivalence calculations with nominal and effective interest rates - Debt Management
	3	Understanding the 3 Worths, Capitalized Cost and Capitalized Recovery	***Park:*** 5, 6	- Three Worths: Present Worth, PW; Annual Equivalence, AE; Future Worth, FW - Evaluation of Alternatives based on time value of money - Capitalized Costs - Capitalized Recovery - Life Cycle Cost Analysis
	4	Understanding Rates of Return	***Park:*** 7	- Return on Investment (ROI) - IRR: Internal Rate of Return - Incremental IRR - Mutually Exclusive Alternatives
	5	Benefit-Cost Analysis and its Implication for Public Sector Projects	***Park:*** 16.3 and 16.4	- Why Benefit-Cost Analysis (BCA) is used in Public Sector Projects - Valuation of Benefits and Costs - Definition of Benefit-Cost Ratio (BCR) - Calculation of BCR (including Incremental BCR)

Overview	#	Topics	Book Chapter(s)	Details
Basics of Engineering Economics	6	Depreciation and Financial Statements	*Park:* 9.1 – 9.6, 2.2.2, 2.2.3, 10.2,	- Overview of Depreciation - Depreciable versus Non-Depreciable Assets - Types of Depreciation - Introduction to Income Statements - Introduction to Cash Flow Statements

	7	After Tax Analysis	*Park:* 9.7 – 9.10, 10.3, 10.4	- Corporate taxes
				- Treatment of capital gains and losses
				- Treatment of non-cash expenses
				- After tax cash flow
				  o Developing cash flow statements
				  o Developing cash flow equations
				  o Application of Excel to after tax analysis

	8	Inflation	*Park:* 11	- Introduction to Inflation - Measuring / assessing inflation - Equivalence calculation under inflation (real, constant, actual dollars) - Impact of inflation on capital projects
	9	Retirements & Replacements	*Park:* 14	- Basic Concepts and terminologies - Economic life - Replacement analysis under different conditions - Replacement analysis with after tax consideration
	10	Cost Concepts and Capital Budgeting	*Park:* 8.1 – 8.4, 15	- General cost concepts including the classification of costs / types of costs - Introduction to capital budgeting - Cost of capital - Choice of MARR - Capital budgeting decisions
	11	Sensitivity Analysis	*Park:* 12.1, 12.2	- Overview of break-even analysis - Overview of sensitivity analysis - Calculations and graphs used in sensitivity analysis - Evaluating mutually exclusive alternatives using sensitivity analysis

Overview	#	Topics	Book Chapter(s)	Details
Special Topics in Engineering Economics	12	Decision & Risk Analysis	*Park:* 12	- Overview of project risk - Introduction to probability concepts for investment decisions - Probability distribution for NPW decision - Comparing mutually exclusive risky alternatives - Overview of risk simulation - Overview of decision tree analysis in investment decisions
	13	Introduction to Financial Accounting	*Park:* 2, 8.5	- What is accounting? - Importance of accounting to engineering and project managers - Basic Accounting Terms and Concepts - How financial data is used by investors, managers and others - The structure of the four most important financial reports and how to use them - Important financial ratios

Date	Lecture	Homework Problems and Exams*	HW Review	In-Class Paragraph & Discuss
Week 1	1	-	-	
Week 2	2	-	-	X
Week 3	3	-	-	X
Week 4	4	HW #1 (Lectures 1, 2 and 3) Due	-	X
Week 5	5	-	HW 1 Review	X
Week 6	6	HW #2 (Lectures 4 and 5) Due	-	X
Week 7	7	-	HW 2 Review	X
Week 8	8	HW # 3 (Lectures 6 and 7) Due by 3pm	HW 3 Review	
Week 9	9	**Midterm Exam** (Lectures 1 – 7) **Due by 3pm**	-	
Week 10	10	HW #4 (Lectures 8 and 9) Due	-	X
Week 11	11		HW 4 Review	X
Week 12	12	HW #5 (Lectures 10 and 11) Due	-	X
Week 13	13		HW 5 Review	X
Week 14		THANKSGIVING	-	
Week 15	-	HW # 6 (Lectures 12 and 13) Due by 3pm	HW 6 Review	
Week 16	-	**Final Exam** (Lectures 8 – 14) **Due by 3pm**		

GRADE BREAKUP:
Homework Problems – 25%
Midterm – 25%
Final – 30%
Discussion – 20% (10 * 2% = 20%)

IMPORTANT NOTES*:

- All assignments are due by the date and before the end of class or as provided in the schedule.

- The Excel based assignments need to be formatted to fit on a standard page and have to be submitted electronically only. Please make sure to put in your name and the problem number on your Excel spreadsheet, as well as, in the subject line of the email.

- *THE SUBMISSION DEADLINE WILL BE FOLLOWED STRICTLY. ANY SUBMISSION BEYOND THE STIPULATED DEADLINE WILL RESULT IN A ZERO CREDIT FOR THAT PARTICULAR ASSIGNMENT.*